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basins are numerous; the drainage has not been completed. It is quite recently that the glacier left there, as compared with Kansas. The Turtle mountains are, probably, the spot where the retreating glacier lingered longest. Its osars and kames seem like the ridges of gravel described as on and about the southern edge of the great Muir glacier, of Alaska. The phenomena are all new. In northeast Kansas› the glacial phenomena are old, very old. Great morainic deposits, in Brown, Leavenworth and Douglas counties, are hidden by vegetation, which has covered the largest bowlders, and the deposits of gravels and clays have been assorted and arranged, and hills have been rounded to the angle of conservation.

The loess which belongs to the newer ice age has overlapped parts of glaciated Kansas; but there is an older loess that in places is very distinct, and the newer and the older loess, in front of the retreating, ice-carried icebergs, great or small, which accounts for a few glacial, subangular bowlders that have been found many miles beyond the limits recognized above as those of the ice sheet.

THE VARIABLE CHEMICAL COMPOSITION OF PLANTS AT DIFFERENT SEASONS—ILLUSTRATED BY TARAXACUM DENS-LEONIS.

BY PROF. L. E. SAYRE, UNIVERSITY OF KANSAS.

It is perhaps a well-known fact that the soluble principles elaborated by plants at different times during their growth differ very greatly, not only in quantity but also markedly in quality. For example, the common persimmon contains during the summer and until about frost a large percentage of a peculiar kind of tannin, which becomes replaced about the time of frost by glucose, pectin, yellow coloring matter, etc. Early in the spring, dandelion root contains uncrystallizable sugar, which diminishes during the summer. In autumn, it abounds in that starchy principle common to many of the roots of the natural order Compositæ, known by the name of "inulin." Pectin is also present to a large extent. There is also a bitter principle found in taraxacum root, called taraxacin, which makes it so valuable as a medical agent. Finally, it contains a very small percentage of a peculiar acrid principle soluble in alcoholic solutions.

Some years ago the attention of pharmacologists was directed to the subject: "The proper time for collection of dandelion root." Reviewing the literature, I find many communications to the journals from the pens of very able men; but these authorities differ as to the proper season for its collection and preparation for medicinal use, and, so far as I am able to learn, it is now a somewhat unsettled question. Very different seasons of the year are now recommended as the proper time for gathering. One authority recommends the beginning of spring, even before blooming; another, July, August, and September; another, that it should be collected between September and February. It stands to reason that that season of the year in which the bitter principle, taraxacin, is most abundant is the best time for collecting and drying. It has therefore occurred to me that I might bring forward this subject anew, and at different seasons of the year make such analyses of the root as will show the proportion and total amount of the various principles contained in the plant, making special note of the most important principle, taraxacin.

As I have just begun a series of analyses of the same roots collected in May and September, neither of these being fully completed, I shall be able to report only a few results in connection with the subject. I may add, also, that as the exact method of analysis has not been fully decided upon, I am obliged to say that the figures I herewith give may in future require some alteration.

The following table shows results of a preliminary analysis:

EXAMINATION OF TARAXACUM ROOT COLLECTED IN —

	May.	*September.*
Moisture in fresh root, dried at 45° C	81.24 per cent.	73.00 per cent.
Loss in drying, at 100° C	13.45 "	11.79 "
Juice extracted by pressure	57.00 "	very small "
Percentage of solid in juice	1.472 "	.....
Reducible sugar in juice	.036 "	.02052 "

At a future time I hope to be able to verify these figures, and at the same time make a fuller report of all the principal constituents of the root at various seasons of the year.

THE NIOBRARA CRETACEOUS OF WESTERN KANSAS.

BY S. W. WILLISTON, STATE UNIVERSITY, LAWRENCE.

Even an approximately correct map of the outcrops of the Niobrara cretaceous in Kansas cannot be given until they have been systematically surveyed. The overlying tertiary is everywhere unconformable, and is found at varying levels, even within short distances. It is very evident that the main valleys of the region had been eroded before the deposition of the tertiary rocks, and, although the sandstones have been since almost wholly eroded in the valleys, yet they remain in isolated patches over a large part of the Niobrara region.

The most northern exposures of the rocks are said to be on the Sappa, but I have seen them only as far north as the Prairie Dog, where they occur at various places in the immediate river valley from Norton to the State line. On the North Fork of the Solomon the Niobrara reaches nearly to Lenora, though the western outcrops are insignificant. On the South Fork it appears as far west as the extreme western line of Graham county. On the Saline it reaches only a little way into Trego county. By far the greatest amount of exposure is found in the valley of the Smoky Hill, where denuded areas are found quite to the western line of the State. South of the Smoky Hill the exposures are very few.

At another time I shall give more fully the history of the explorations of these regions; at present a brief sketch will suffice. Almost the earliest collections of fossils from this region were made by army surgeons stationed at Fort Hays or Fort Wallace, especially Doctors Janeway and Sternberg.

The next explorer to make any scientific examination of the beds was, I think, Professor Mudge; but the first collections of moment were made by Professor Marsh, with a party of Yale students, who spent several weeks in the vicinity of Wallace, under an escort of United States soldiers, in 1870.

In 1871, Professor Cope made some valuable collections in the same region, an account of which is given in his Cretaceous Vertebrata. Again, in 1872, Professor Marsh with a party spent several weeks, under hardships similar to those of his first expedition, on the upper Smoky Hill. In this and the following season, Professor Mudge made collections in the northern part of the State, among which was the first specimen of a bird showing teeth, which specimen has never been equaled since. All these collections, however, were trivial in amount and value to the extensive collections made during the following four or five years, by parties of which Professor Mudge, H. A. Brous, E. W. Guild, George Cooper, Charles Sternberg and the writer were members.